What is claimed is:

1. A function arithmetic method comprising:

a cyclic equation setting step transforming and setting a Taylor series equation for calculating a sine function into a single cyclic equation common to terms of the Taylor series equation, the single cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

an adjustment step adjusting and preparing the shift number S such that within a variation range of the variable X the variable X has a maximum value 1 with the constant K being not greater than 1; and

a cyclic equation executing step inputting and converting angle information i to the variable X, and executing the cyclic equation in sequence from higher order term to lower order term for the number of terms of the Taylor series equation to derive a sine function of the angle information i.

2. The function arithmetic method according to claim 1, wherein

the cyclic equation executing step includes executing the arithmetic process of the known number Q, the variable X, an intermediate value after the shifting and the constant K of the cyclic equation with the number of bits that is obtained by adding the number of protect bits to the final number of the bits.

3. A function arithmetic method comprising:

a cyclic equation setting step transforming and setting a Taylor series equation for calculating a cosine function into a single cyclic equation common to terms of the Taylor series equation, the single cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

an adjustment step adjusting and preparing the shift number S such that within a variation range of the variable X the variable X has a maximum value 1 with the constant K being not greater than 1; and

a cyclic equation executing step inputting and converting angle information i to the variable X, and executing the cyclic equation in sequence from higher order term to lower order term for the

number of terms of the Taylor series equation to derive a cosine function of the angle information i.

4. The function arithmetic method according to claim 3, wherein

the cyclic equation executing step includes executing the arithmetic process of the known number Q, the variable X, an intermediate value after the shifting and the constant K of the cyclic equation with the number of bits that is obtained by adding the number of protect bits to the final number of the bits.

5. A function arithmetic circuit comprising:

a cyclic equation arithmetic unit calculating a cyclic equation that is obtained by transforming a Taylor series equation for calculating a sine function, the cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

a conversion adjustment unit converting input angle information i into the variable X, as well as adjusting and outputting the shift number S such that the variable X has a maximum value 1

within a variation range of the variable X;

a constant table finding in advance and holding constants K corresponding to terms of a Taylor series equation for calculating a sine function and the shift numbers adjusted such that the constants K becomes not greater than 1; and

an arithmetic control unit causing the cyclic equation arithmetic unit to perform a cyclic arithmetic in sequence, based on the selection of the constant K and the shift number S of the constant table, from higher order term to lower order term for the number of terms of the Taylor series equation defined in advance when the variable X is output from the conversion adjustment unit, to thereby derive a sine function of the angle information i.

6. The function arithmetic circuit according to claim 5, wherein

the cyclic equation arithmetic unit executes the arithmetic process of the known number Q, the variable X, an intermediate value after the shifting and the constant K of the cyclic equation with the number of bits that is obtained by adding the number of protect bits to the final number of the bits.

7. A function arithmetic circuit comprising:

a cyclic equation arithmetic unit calculating a cyclic equation that is obtained by transforming a Taylor series equation for calculating a cosine function, the cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

a conversion adjustment unit converting input angle information i into the variable X, as well as adjusting and outputting the shift number S such that the variable X has a maximum value 1 within a variation range of the variable X;

a constant table finding in advance and holding constants K corresponding to terms of the Taylor series equation for calculating a cosine function and the shift numbers adjusted such that the constants K become not greater than 1; and

an arithmetic control unit causing the cyclic equation arithmetic unit to perform a cyclic arithmetic in sequence, based on the selection of the constant K and the shift number S of the constant table, from higher order term to lower order term for the number of terms of the Taylor series equation defined in advance when the

variable X is output from the conversion adjustment unit, to thereby derive a cosine function of the angle information i.

8. The function arithmetic circuit according to claim 7, wherein

the cyclic equation arithmetic unit executes the arithmetic process of the known number Q, the variable X, an intermediate value after the shifting and the constant K of the cyclic equation with the number of bits that is obtained by adding the number of protect bits to the final number of the bits.

9. A function arithmetic circuit comprising:

a pipeline arithmetic unit forming a pipeline connection which includes cyclic equation arithmetic units each provided for each term and calculating a cyclic equation obtained by transforming a Taylor series equation for calculating a sine function, the cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

a conversion adjustment unit converting input angle information i into the variable X and

adjusting the shift number S such that the variable X has a maximum value 1 within a variation range of the variable X for the output to the pipeline arithmetic unit;

a constant table finding in advance and holding the constants K corresponding to terms of the Taylor series equation for calculating a sine function and the shift numbers adjusted such that the constants K become not greater than 1; and

a pipeline control unit causing the cyclic equation arithmetic units of the pipeline arithmetic unit to select the constant K and the shift number S of the corresponding term of the Taylor series equation from the constant table, to calculate in parallel and to derive a sine function of the angle information i based on the output of the cyclic equation arithmetic unit at the final stage, each time the variable X is output from the conversion adjustment unit.

10. The function arithmetic circuit according to claim 9, wherein

the cyclic equation arithmetic units of the pipeline arithmetic unit execute the arithmetic process of the known number Q, the variable X, an intermediate value after the shifting and the constant K of the cyclic equation with the number

of bits that is obtained by adding the number of protect bits to the final number of the bits.

11. A function arithmetic circuit comprising:

a pipeline arithmetic unit forming a pipeline connection which includes cyclic equation arithmetic units each provided for each term and calculating a cyclic equation obtained by transforming a Taylor series equation for calculating a cosine function, the cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

a conversion adjustment unit converting input angle information i into the variable X and adjusting the shift number S such that the variable X has a maximum value 1 within a variation range of the variable X for the output to the pipeline arithmetic unit;

a constant table finding in advance and holding the constants K corresponding to terms of the Taylor series equation for calculating a cosine function and the shift numbers adjusted such that the constants K become not greater than 1; and

a pipeline control unit causing the cyclic equation arithmetic units of the pipeline arithmetic unit to select the constant K and the shift number S of the corresponding term of the Taylor series equation from the constant table, to calculate in parallel and to derive a cosine function of the angle information i based on the output of the cyclic equation arithmetic unit at the final stage, each time the variable X is output from the conversion adjustment unit.

12. The function arithmetic circuit according to claim 11, wherein

the cyclic equation arithmetic units of the pipeline arithmetic unit execute the arithmetic process of the known number Q, the variable X, an intermediate value after the shifting and the constant K of the cyclic equation with the number of bits that is obtained by adding the number of protect bits to the final number of the bits.

13. A function arithmetic circuit comprising a sine function arithmetic circuit and a cosine function arithmetic circuit,

the sine function arithmetic circuit including:

a pipeline arithmetic unit forming a pipeline

connection which includes cyclic equation arithmetic units each provided for each term and calculating a cyclic equation obtained by transforming a Taylor series equation for calculating a sine function, the cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

a conversion adjustment unit converting input angle information i into the variable X and adjusting the shift number S such that the variable X has a maximum value 1 within a variation range of the variable X for the output to the pipeline arithmetic unit;

a constant table finding in advance and holding the constants K corresponding to terms of the Taylor series equation for calculating a sine function and the shift numbers adjusted such that the constants K become not greater than 1; and

a pipeline control unit causing the cyclic equation arithmetic units of the pipeline arithmetic unit to select the constant K and the shift number S of the corresponding term of the Taylor series equation from the constant table, to calculate in parallel and to derive a sine function of the angle information i based on the

output of the cyclic equation arithmetic unit at the final stage, each time the variable X is output from the conversion adjustment unit, and wherein

the cosine function arithmetic circuit including:

a pipeline arithmetic unit forming a pipeline connection which includes cyclic equation arithmetic units each provided for each term and calculating a cyclic equation obtained by transforming a Taylor series equation for calculating a cosine function, the cyclic equation having a new known number Q that is defined by multiplying a known number Q and the square of a variable X, shifting the result by a shift number S and then adding a constant K thereto;

a conversion adjustment unit converting input angle information i into the variable X and adjusting the shift number S such that the variable X has a maximum value 1 within a variation range of the variable X for the output to the pipeline arithmetic unit;

a constant table finding in advance and holding the constants K corresponding to terms of the Taylor series equation for calculating a cosine function and the shift numbers adjusted such that the constants K become not greater than

1; and

a pipeline control unit causing the cyclic equation arithmetic units of the pipeline arithmetic unit to select the constant K and the shift number S of the corresponding term of the Taylor series equation from the constant table, to calculate in parallel and to derive a cosine function of the angle information i based on the output of the cyclic equation arithmetic unit at the final stage, each time the variable X is output from the conversion adjustment unit.

14. The function arithmetic circuit according to claim 13, wherein

the cyclic equation arithmetic units of the pipeline arithmetic unit execute the arithmetic process of the known number Q, the variable X, an intermediate value after the shifting and the constant K of the cyclic equation with the number of bits that is obtained by adding the number of protect bits to the final number of the bits.

15. The function arithmetic circuit according to claim 13, wherein

twist coefficient values of a plurality of butterfly stages provided in a pipeline fast Fourier transform apparatus whose radix is 2 are

calculated based on the sine function and cosine function of the input information i.

16. A function arithmetic method comprising:

a cyclic equation setting step transforming and setting a Taylor series equation for calculating a transcendental function into a single cyclic equation common to terms of the Taylor series equation, the cyclic equation having a new known number Q that is defined by multiplying a known number Q and a variable X, shifting the result by a shift number S and then adding a constant K thereto;

an adjustment step adjusting and preparing the shift number S such that within a variation range of the variable X the variable X has a maximum value 1 with the constant K being not greater than 1; and

a cyclic equation executing step converting input information to the variable X and executing the cyclic equation in sequence from higher order term to lower order term for the number of terms of the Taylor series equation to thereby derive a transcendental function of the input information.